INSTITIÚID ÁRD-LÉINN BHAILE ÁTHA CLIATH
(Dublin Institute for Advanced Studies)

Annual Report of the work of the Institute and its Constituent Schools presented by the Council to the Minister for Education in respect of the Financial Year 1950-1951.

Pr. 1086

INSTITIÚID ÁRD-LÉINN BHAILE ÁTHA CLIATH
(Dublin Institute for Advanced Studies)

Annual Report of the work of the Institute and its Constituent Schools presented by the Council for the Financial Year 1950-1951

In accordance with the provisions of Section 29 of the Institute for Advanced Studies Act, 1940 (No. 13 of 1940), the Council of the Institute has the honour to present to the Minister for Education for submission to the Government a report of the work and activities of the Institute and its Constituent Schools for the financial year ending 31st March, 1951.

The general purpose which it is hoped to accomplish is clearly stated in the Act establishing the Institute, namely, the Institute for Advanced Studies Act, 1940 (No. 13 of 1940) and in the Establishment Orders establishing the three Constituent Schools, namely, the Institute for Advanced Studies (School of Celtic Studies) Establishment Order, 1940, the Institute for Advanced Studies (School of Theoretical Physics) Establishment Order, 1940, and the Institute for Advanced Studies (School of Cosmic Physics) Establishment Order, 1947, and need not be referred to here. It is deemed desirable, however, to include in the report for the purposes of record certain particulars about the constitution of the Council of the Institute and of the membership of the Governing Boards of the three Constituent Schools on the 31st March, 1951.

The report is presented under the following principal heads:-

I - Constitution of the Council of the Institute and of the Governing Boards of the three Constituent Schools on the 31st March, 1951.

II - Report of the Governing Board of the School of Celtic Studies.

III - Report of the Governing Board of the School of Theoretical Physics.

IV - Report of the Governing Board of the School of Cosmic Physics.

I - Constitution of the Council of the Institute and of the Governing Boards of the three Constituent Schools on the 31st March 1951.

1. THE COUNCIL OF THE INSTITUTE.

Chairman:

Right Reverend Monsignor Patrick Browne, M.A., D.Sc.

Ex-Officio Members:

Dr. Michael Tierney, M.A., D.Litt.,
President, University College, Dublin;

Dr. Ernest H. Alton, M.A., Litt.D.,
Provost, Trinity College, Dublin;

Professor John J. Nolan, M.A., D.Sc.,
President, Royal Irish Academy.

Members Appointed by the Governing Boards of the Constituent Schools:

Right Reverend Monsignor Patrick Boylan, D.D., M.A., D.Litt.;

Professor Michael A. O'Brien, M.A., Ph.D.;

Professor Felix E. W. Hackett, M.A., M.Sc., Ph.D.;

Professor Albert J. McConnell, M.A., M.Sc., Sc.D., F.T.C.D.;

Professor Leo W. Pollak, Ph.D., M.R.I.A.

2. THE GOVERNING BOARD OF THE SCHOOL OF CELTIC STUDIES.

Chairman:

Right Reverend Monsignor Patrick Boylan, D.D., M.A., D.Litt.

Senior Professors:

Michael A. O'Brien, M.A., Ph.D.;

Daniel A. Binchy, M.A., Ph.D., B.L.;

Myles Dillon, M.A., Ph.D.;

Appointed Members:

Miss Áine de Paor, M.A., Ph.D.;

Reverend John Ryan, S.J., M.A., D.Litt.;

Reverend Francis Shaw, S.J., M.A.;

Éamonn Mac Giolla Iasachta, M.A., D.Litt., M.R.I.A.;

Ernest Gordon Quin, M.A., F.T.C.D.;

Reverend Donnchadh Ó Floinn, M.A.

3. THE GOVERNING BOARD OF THE SCHOOL OF THEORETICAL PHYSICS.

Chairman:

Vacant.

Senior Professors:

Erwin Schroedinger, M.A., Ph.D., D.Sc.;

John L. Synge, M.A., Sc.D., M.R.I.A., F.R.S.C., F.R.S.

Appointed Members:

Felix E. W. Hackett, M.A., M.Sc., Ph.D.;

Albert J. McConnell, M.A., M.Sc., Sc.D., F.T.C.D.;

Alfred O'Rahilly, M.A., D.Sc., D.Phil., D.Litt.;

George R. Keating, M.Sc.;

Thomas S. Wheeler, Ph.D., D.Sc., F.R.C.Sc.I.;

Reverend James R. McConnell, D.Sc.;

Máirtín Ó Tnúthail, M.Sc.

4. THE GOVERNING BOARD OF THE SCHOOL OF COSMIC PHYSICS.

Chairman:

John J. Nolan, M.A., D.Sc.

Senior Professors:

Leo W. Pollak, Ph.D., M.R.I.A.;

Hermann A. Brück, D.Phil., Ph.D., M.R.I.A.

Appointed Members:

John J. Dowling, M.A., F.Inst.Phys.;

Eric M. Lindsay, M.A., M.Sc., Ph.D.;

Rev. Patrick J. I. McLaughlin, D.Sc.;

Thomas Edwin Nevin, D.Sc.;

Patrick J. Nolan, Ph.D., D.Sc.;

John H. J. Poole, M.A., B.A.I., Sc.D.;

Ernest T. S. Walton, M.A., M.Sc., Ph.D., F.T.C.D.;

Mariano Doporto, D.Phys.Sc.

II - Report of the Governing Board of the School of Celtic Studies.

1. ACADEMIC STAFF, SCHOLARS AND EXTERN RESEARCH WORKERS

Senior Professors:

Michael A. O'Brien, Director of the School;

Daniel A. Binchy;

Myles Dillon.

Assistant Professors:

Brian Ó Cuív;

James P. Carney;

Miss Cecile O'Rahilly;

David Greene.

Assistant:

Miss Sheila Falconer.

Scholars:

Louis Paul Némo (Roparz Hémon);

Rev. Cuthbert McGrath, O.F.M.;

Mrs. Nessa Doran;

Heinrich Wagner.

Extern Research Workers commissioned by the School:

Dr. T. F. O'Rahilly;

Dr. R. I. Best;

Dr. Osborn Bergin;

Mr. Seán Mac Airt;

Mr. Liam Price;

Mrs. Mary Ellen Carney;

Rev. Shan Ó Cuív;

Professor J. Vendryès;

Dr. Tomás de Bhaldraithe;

Rev. Seán Ó Cathán, S.J.;

Rev. Lambert McKenna, S.J.;

Rev. Canice Mooney, O.F.M.;

Rev. Anselm Faulkner, O.F.M.;

Rev. Pádraig Ó Suilleabháin, O.F.M.

2. GENERAL LINES OF RESEARCH WORK.

During the year the School continued research work in all branches of Irish study. At the end of the year under review, twenty-two volumes edited by members of the School were in the press and nineteen further works were in course of preparation.

Work on the modern spoken dialects continued and considerable progress was made in the collection of material for the Irish Linguistic Atlas.

Plans for a complete Dictionary of Classical Modern Irish, in connection with which the School has been making large collections for years, were drawn up and the work was begun.

The Mediaeval and Modern Irish Texts Series, intended to provide handy and up-to-date editions of Irish texts for the use of University and other students, made good progress during the year. Two new texts were sent to press and two others, long out of print, were being reprinted.

The Etymological Dictionary of the Irish Language by Professor Vendryès was well under way.

A further part of the Journal of the School (Celtica, Vol.I, pt.2) under the editorship of Professor T. F. O'Rahilly appeared in 1950 and material for Vol.II, pt.1 was either being prepared or was in the press at the end of the period under review.

A complete record of the work of the individual members of the academic staff, scholars and research workers follows.

Senior Professors:

Michael A. O'Brien: Editor of Celtica; continued work on Vols. 1, 2 and 3 of Corpus Genealogiarum Hibernicarum of which Vol. 1 was in the press: a new edition of the Old Irish Life of St. Brigid and a new edition of the Feast of Bricriu were in preparation.

Daniel A. Binchy: Work on Early Irish Law and legal texts. During the year Dr. Binchy continued his seminar on Early Irish Law.

Myles Dillon: Final revision of the letter G for the Royal Irish Academy's Contributions to a Dictionary of the Irish Language was completed and sent to printers; Dr. Flower's index to the Catalogue of Irish MSS. in the British Museum was sent to printers; a new edition of Serglige Con Culaind was prepared for press; a new edition of The Book of Rights was in preparation.

Assistant Professors:

Brian Ó Cuív: An edition of Párliament na mBan in the press; three lectures on Irish Dialects and Irish-Speaking Districts in the press.

James P. Carney: Work on genealogical material dealing with the O'Reillys continued. Since October 1950 on leave of absence as Visiting Lecturer at Uppsala University where he has given courses on Irish and Irish Literature.

Miss Cecile O'Rahilly: Edition of five seventeenth century Irish poems completed and sent to printers.

David Greene: Preparation of an edition of poems on the Maguires of Fermanagh from a Copenhagen MS.

Assistant:

Miss Sheila Falconer: An edition of an Early Modern Irish version of the Quest of the Holy Grail in the press; work proceeded on The Verbal System of the LU Táin.

Scholars:

Roparz Hémon: Edition of an Early Modern Breton play and two studies on the Grammar of Modern Breton. During the year continued his course of lectures on Middle and Modern Breton.

Rev. Cuthbert McGrath, O.F.M.: Work on Plunket's Irish Dictionary in progress; two volumes of Franciscan verse in the press.

Mrs. Nessa Doran: Transcript of manuscript C. IV. 1 (a large collection of Bardic Poetry) completed.

Heinrich Wagner: Material for an Irish Linguistic Atlas collected in Donegal, Tipperary, Waterford, Louth, Kerry, Sligo, Mayo, Leitrim, Galway, Tyrone and Isle of Man; a volume on The Irish of Teelin in the press.

Extern Research Workers:

Dr. T. F. O'Rahilly: Edited Celtica Vol.I, pt.2.

Dr. R. I. Best: First fasciculus of an edition of the Book of Leinster in the press.

Dr. O. Bergin: (till his lamented death in 1950) revision of first fasciculus of the Book of Leinster.

Seán Mac Airt: New edition of the Annals of Inisfallen in the press; work commenced on a new edition of the Annals of Ulster.

Liam Price: Work continued on the Place-Names of Wicklow.

Mrs. Mary Ellen Carney: Work continued on the Irish version of the Aphorisms of Hippocrates.

Rev. Shan Ó Cuív: A Bibliography of the works of Canon Peter O'Leary completed.

Professor Vendryès: Edition of Airne Fíngein completed and sent to printers; work on an etymological dictionary of Irish continued.

Tomás de Bhaldraithe: Work on the Phonology and Grammar of the Irish of Cois Fhairrge completed and sent to printers.

Rev. Seán Ó Catháin, S.J.: Edition of Betha Mhuire completed and sent to printers.

Rev. Lambert McKenna, S.J.: Edition of the Poem Book of the O'Haras completed and in the press.

Rev. Canice Mooney, O.F.M.: Edition of Scéthán Shacramuinte na hAithridhe completed and sent to printers; an edition of Poenitentiarium Sancti Maelrusin prepared for Celtica.

Rev. Anselm Faulkner, O.F.M.: Edition of Parrthas an Anma in the press; editions of Beatha Dhiadha and Scéthán Spioradálta in progress.

Rev. Pádraig Ó Súilleabháin, O.F.M.: Editions of Rialachas San Froinsias, Beatha San Froinsias and Lucerna Fidelium in the press; work on editions of Buaidh na Croiche and An tAithridheach Ríogha in progress.

In addition to the main work of the School outlined above, editions of some short texts in Irish and Welsh and articles dealing with literary and linguistic problems in Old, Middle and Modern Irish were prepared and accepted for publication in the following periodicals:-

Celtica, Vol.II, Part 1:

An Irish Tract on the Stations of the Cross	by Brian Ó Cuív.
Two Mediaeval Irish Treatises on Horses	by Brian Ó Cuív.
Lapidaries in Irish	by David Greene.

A Welsh Lapidary	by David Greene.
The Irish Versions of the Letter of Prester John	by David Greene.
St. Brigid's Alefeast	by David Greene.
An Early Modern Irish poem Cam Fraoich Soitheach na Scorchlann	by James Carney.

Eriu:

A Middle Irish Poem on the birth of Aedan mac Gebrain and Brandub mac Echach	by M.A. O'Brien.
The Saga of Fergus mac Leite	by D.A. Binchy.
The Finding of Cashel	by Myles Dillon.
The first plural of the Imperative in Irish	by Brian Ó Cuív.
Middle Quantity in Irish	by David Greene.

Proceedings of the Royal Irish Academy:

The Taboos of the Irish Kings	by Myles Dillon.

Éirse:

Some Developments in the Imperative Mood in Irish	by Brian Ó Cuív.
The Seventeen Wonders of the Night of Christ's Birth	by Brian Ó Cuív.

3. SEMINAR AND LECTURES.

Professor Binchy continued his Seminar on Early Irish Law. Meetings were held weekly on Thursdays during the university terms.

A course of lectures on Middle Breton was given by M. Roparz Hémon. Lectures were delivered weekly during the university terms.

4. STATUTORY PUBLIC LECTURE.

The Statutory Public Lecture under the auspices of the School was delivered by Mr. David Greene in University College, Dublin, on Friday, the 2nd March 1951. Mr. Greene's subject was The Art of Translation.

5. PUBLICATIONS.

The following works were published during the period under review.

		Date of Publication
POEMS ON THE O'REILLYS. James Carney.	Edited by	15/6/50
pp. xv + 315.	Price 12s. 6d.	
CELTICA. Vol.I,Part 2. T.F. O'Rahilly.	Edited by	13/12/50
pp. iv + 243.	Price 5s.	

III - Report of the Governing Board of the School of Theoretical Physics.

1. ACADEMIC STAFF AND SCHOLARS.

Senior Professors:

Erwin Schroedinger, Director of the School;

John L. Synge.

Visiting Professor:

Herbert S. Green.

Scholars:

D. Basu (left July 1950);

N. Symonds (left September 1950);

Rev. E. McMullin (left September 1950);

W. Thirring (left September 1950);

H. Messel (entered October 1950);

J. W. Gardner (entered October 1950);

Rev. J. McMahon (entered October 1950);

O. Bergmann (entered January 1951);

O. Hittmair (entered January 1951).

Technical Assistant:

Miss Mary Houston.

2. GENERAL LINES OF RESEARCH WORK.

The research work included a number of widely different subjects, in particular -

(a) The quantum-mechanical theory of molecular assemblies (Green).

Professor Green's work included the last three chapters of a book on "The Molecular Theory of Flow", as well as several papers, dealing with molecular interaction at very low temperature (degenerate state) and with irreversible phenomena.

(b) The cascade theory of cosmic radiation, quite especially of nuclear showers (Messel, Gardner, Green).

While Gardner and Green were studying particular collision problems, Messel developed the general statistical theory of cascades in cosmic rays.

(c) Exploration of the practical possibilities of the hypercircle method (Synge, McMahon).

Four chapters of a book on this method have been completed. Some special problems have been numerically solved.

(d) Further investigation of the "non-symmetric" generalization of the theory of gravitation (Schroedinger).

A general approximation method has been developed and carried through the first stage. Conservation theorems were established.

(e) The latest attempts to cope with the "divergence"-difficulties in quantum-electrodynamics and field-quantization in general (Thirring).

Higher (than the second) order wave-equations were investigated and shewn to lead automatically to the avoiding of certain "infinities". The so-called Klein-Nishina formula, which concerns the interaction of light-waves and electronic waves, was corrected for what is called the damping effect, i.e. the reaction on the electron by the radiation it emits on being deflected.

(f) Practical computation of scattering cross-sections (Bergmann).

This work concerns practical methods for computing the wave-mechanical phase-shifts (in the collision of two particles) from their interaction potential, assumed to be given.

3. SEMINAR AND LECTURES.

During the summer term of 1950 the Seminar and other lecture courses were continued without change.

Professor Schroedinger conducted the Wednesday Seminar on Introduction to Space-Time Structure. Dr. Thirring lectured on Quantum Electrodynamics on Fridays.

Professor Synge concluded his course on Hydrodynamical Stability and other classical problems and gave 4 lectures on the Fundamental Theorem of Electrical Networks (dealing with Kron's Matrix). This subject aroused the interest of many electrical engineers and the attendance at the lectures was over 20. During November 1950 Professor Synge gave 3 lectures on Whitehead's Theory of Relativity.

Professor Green conducted the Seminar during the two winter terms. His first subject was Quantized Field Theories, and after the new year, The Statistical Mechanics of Assemblies of Interacting Particles.

The courses were, as usual, attended by students and members of Staff from University College, Dublin, Trinity College, Dublin and St. Patrick's College, Maynooth, as well as members of the two Physics Schools of the Institute.

4. STATUTORY PUBLIC LECTURE.

The Statutory Public Lecture under the auspices of the School was delivered in Trinity College, Dublin, on Friday 1st December, 1950 at 8 p.m. by Professor J. L. Synge. His subject was Form and Number.

5. VISITING PROFESSOR.

Professor H. S. Green (now of the University of Adelaide, S. Australia) spent the academic year 1950-1951 as Visiting Professor at the Institute.

6. DISTINGUISHED VISITORS.

Professor Philipp Frank of Harvard University spent a few days in Dublin at the invitation of the Institute in January 1951. He gave a special lecture to the Seminar on 9th January under the title Philosophical Interpretations and Misinterpretations of the Theory of Relativity at which about 30 persons were present. On the following

evening he lectured in University College, Dublin, on Philosophical Interpretations and Misinterpretations of Modern Physics.

Professor W. Heitler of the University of Zürich, former Senior Professor and Director of the School, visited the Institute on March 19th. Although on holiday he very kindly consented to give a short talk to the members of the Physics Schools.

7. PROFESSORS' ACTIVITIES.

Professor Schroedinger took part in the annual three weeks meeting of the "Austrian College" which took place from 20 August to 8 September in Alpbach, and lectured in the "Wintersemester" (October 1950 to January 1951) as a guest Professor at the University of Innsbruck.

Professor Schroedinger broadcast two talks, one in English and one in German, from the B.B.C. in August 1950. The title of the talks was: The Future of Understanding (Die Zukunft des Weltverstehens).

Professor Synge attended the Jubilee Celebration of Professor Francesco Severi in Rome in April 1950, and read a paper on Approximations in boundary-value problems by the method of the hypercircle in function-space. He was granted leave of absence for the six months January to June 1951 to act as Visiting Research Professor at the Institute for Fluid Dynamics and Applied Mathematics at the University of Maryland. At that Institute he gave three public lectures on "Hamilton's method in geometrical optics" in February-March 1951. He also gave 3 lectures at the University of Toronto on Science and Commonsense, The Relativity theory of A. N. Whitehead and Hamiltonian geometry (a basis for relativistic mechanics).

8. PUBLICATIONS.

(1) Book:

SCIENCE: SENSE AND NONSENSE. By J. L. Synge.
Jonathan Cape, London, 1951.

(2) Communications of the Dublin Institute for Advanced Studies - Series A : Physics.

No. 6 - Studies in the Non-Symmetric Generalization of the Theory pf Gravitation I. By E. Schroedinger.
Price 2s. 6d. pp. 28. Published 31st January, 1951.

No. 7 - On the Theory of a Nucleon Cascade. By H. Messel.
Price 5s. Od. pp. iii + 103. Published 31st January, 1951.

(3) Contributions to Periodicals:

(a) Contributions recorded as in the press in previous reports:-

J. L. Synge: Note on the Kinematics of Plane Viscous Motion - Quart. App. Maths. 8, No. 1, April 1950.

E. Schroedinger: Irreversibility - P.R.I.A. 53 A 12, 189, 1950.

W. Thirring: On a Fourth-Order Meson-Equation - Phil. Mag., 41, 653, July 1950.

S. N. Gupta: Theory of Longitudinal Photons in Quantum Electrodynamics - Proc. Phys. Soc., A, 63, 681, 1950.

E. Schroedinger: What is an Elementary Particle? - Endeavour, IX, No. 35, July 1950.

W. Thirring: Quantization of Higher Order Equations - Phys. Rev., 79, No. 4, 703, Aug. 15, 1950.

E. Schroedinger: On the Differential Identities of an Affinity - P.R.I.A. 54 A 5, 79, Feb. 1951.

(b) New Contributions:-

E. Corinaldesi and G. Field: Scattering of Pseudoscalar Charged Mesons by Nucleons II. - Phil. Mag. 41, 364, April 1950.

W. Thirring: Radiative Corrections in the Non-Relativistic Limit - Phil. Mag. 41, 1193, Nov. 1950.

H. Messel: On the Fluctuation of a Nucleon Cascade in Homogeneous Nuclear Matter and Calculation of Average Numbers. - P.R.I.A. 54 A 8, 125, Feb. 1951.

J. L. Synge: Field Physics - Reprinted from A Century of Science edited by H. Dingle, Hutchinson, London, 1951.

(4) The following contributions were in the press at the end of the Period under review:-

J. L. Synge: The Fundamental Theorem of Electrical Networks.
On Permanent Vector-Lines in N Dimensions.
On the Gravitational Theory of A. N. Whitehead.
Triangulation in the Hypercircle Method for Plane Problems.

J. W. Gardner: β-α Correlation in the Disintegration of Li^8.
On the Elimination of Divergences from Classical Electrodynamics.

H. S. Green: Quantum Mechanics of Assemblies of Interacting Particles.

H. Messel: On the Nucleon Cascade with Ionization Loss.
On some recent results on the Nucleon Cascade.
Average Numbers for the Development of the Nucleon Component of the Cosmic Radiation in Air.

W. Thirring: Radiative Corrections to the Klein-Nishina Formula.
Pair Creation by Mesons.

H. Messel: A Note on the Development of the Nucleon Component of the Cosmic Radiation in Air when Ionization Losses are Accounted for.
Further Results on the Fluctuation Problem in Electron-Photon Cascade Shower Theory and the Probability Distribution Function.

IV - Report of the Governing Board of the School of Cosmic Physics.

A. Astronomical Section.

1. ACADEMIC STAFF AND SCHOLARS.

Senior Professor:

H. A. Brück.

Chief Assistant:

H. E. Butler.

Assistant:

Miss Máire T. Conway (appointed 1 June 1950).

Assistant (Part-time):

F. J. O'Connor.

Scholer:

A. N. Argue (entered 1 December 1950).

2. EQUIPMENT.

Certain fittings have been added to the solar concave grating spectroscope such as electric motors for the movement of the grating, telescopes for viewing the position of the grating from the camera end of the instrument, and a plate-holder for 30 x 4 inch plates. The spectroscope has also been fitted with a thermostat embodying a platinum resistance thermometer.

Parts for a spectrohelioscope such as a pair of oscillating slits have been constructed in the workshop of the Observatory. The spectrohelioscope when mounted in the Meridian Room next to the main solar spectroscope, will be used for observing visually the Sun in the light of the hydrogen H_α line and for discovering the presence on the Sun of such temporary phenomena as prominences and flares.

Modifications have been introduced into the technique of photo-electric measurement of stellar brightness. A new photo-electric photometer including recording apparatus and an oscilloscope has been installed in the dome on the roof of the main building, and the photometer attached to the 12-inch refractor in the South dome has been improved.

A vacuum plant has been set up in co-operation with Dr. Nevin in the Physics Department of University College, Dublin, for the aluminising of mirrors of up to 22 inches in diameter. The plant consists of a cylindrical welded steel tank which is evacuated down to a pressure of about 10^{-4} mm by a set of vacuum pumps, the property of University College. The various mirrors of the Observatory have been successfully aluminised in this tank.

The 36-inch Schmidt-Baker telescope which is owned and operated jointly by the Armagh, Dunsink and Harvard Observatories, has been completed by the Perkin-Elmer Corporation and shipped from the United States to South Africa. It has been mounted on the site of the Boyden Station of Harvard Observatory at Blomfontein under the supervision of Professor B. Bok of Harvard. The first plates which were taken at the beginning of December, have proved satisfactory.

3. RESEARCH WORK.

An intensive programme of stellar observations was carried out using the 15-inch reflector and the attached photo-electric equipment. The chief object of this work was the investigation of the nature of stellar scintillation or the twinkling of the stars, a problem which very recently has received considerable attention from various sides. The equipment at Dunsink proved to be exceptionally suitable for the type of observation necessary to attack the problem. Some preliminary results which show the objective nature of the phenomenon and its dependence on various conditions, were laid before the meeting of the Royal Astronomical Society in Dublin. A paper giving full details of the observations and results obtained, has been prepared.

In the course of the photo-electric work a method was devised to time automatically the occultation of stars by the Moon. The moment of occultation was recorded together with the signals of the standard clock of the Observatory by means of an oscilloscope and camera with moving film. The times of occultations could thus be found to an accuracy of a hundredth of a second which is about ten times better than can be attained by usual methods. Such photo-electric timing should lead in due course to a considerable improvement in our knowledge of the motion of the Moon. The method was described at the February Meeting of the Royal Astronomical Society.

4. LECTURES AND DISCUSSIONS.

A public lecture on The Sun and a course of eight lectures on Astrophysics were delivered by Professor Brück in University College, Galway, during the Hilary term.

Individual lectures were given by Dr. Butler and Dr. Conway in Dublin, Belfast and Cambridge.

On the occasion of the Dublin meeting of the Royal Astronomical Society in September 1950, a colloquium for the discussion of current problems in solar physics was held under the auspices of the School in the Meeting Room of the Royal Irish Academy. Papers were contributed by Dr. M. A. Ellison of the Royal Observatory, Edinburgh, Mr. F. Hoyle of Cambridge, Professor W. H. McCrea of London, Professor D. H. Menzel of Harvard, Father P. J. Treanor, S.J. of Oxford and Professor H. Zanstra of Amsterdam. A visit to Dunsink brought together about 150 astronomers and guests who were shown round the Observatory by members of the staff.

5. VISITORS.

The practice of the monthly "Open Saturday" has been continued; the attendance has been as high as in previous years. Members of various Societies have also visited the Observatory.

6. PUBLICATIONS.

(1) Contributions from the Dunsink Observatory:

No. 1: H. E. Butler: The Equivalent widths of Calcium and Hydrogen absorption Lines in the Near Infra-Red of Stellar Spectra. (Reprinted from Proc. Roy. Ir. Acad. 54 A 87, 1950).

(2) Dunsink Observatory Reprints:

No. 1: H. E. Butler: Recordings of Scintillation (From The Observatory, 70, 235, 1950).

No. 2: H. E. Butler: Further Recordings of Stellar Scintillation (From The Observatory, 71, 28, 1951).

No. 3. H. E. Butler: Photo-electric Observations of the Scintillation of Stars. (From Nature, 167, 287, 1951).

B. Cosmic Ray Section.

1. ACADEMIC STAFF AND SCHOLARS.

Senior Professor:

Lajos Jánossy. (Resigned 15 October, 1950 to take up a post in the University of Budapest).

Assistant Professor:

C. B. A. McCusker.

Research Associate:

T. E. Nevin.

Scholars:

D.D. Millar (also held a scholarship from the University of St. Andrews).

H. Messel (on a Canadian Government Scholarship. Transferred to School of Theoretical Physics, 1 September, 1950).

D. M. Ritson (resigned 30 June, 1950. Now at University of Rochester, U.S.A.).

2. EXPERIMENTAL AND RESEARCH WORK.

Professor Jánossy resigned his post as Senior Professor to become a Professor in the University of Budapest. His active association with the Cosmic Ray Section ended early in August. From the end of September to the end of the period under review Dr. Nevin supervised the work of the section on behalf of the Governing Board.

The experimental work of the section during the year dealt mainly with certain problems of extensive air showers and the question of multiple or plural production of mesons.

Experimental work carried on by Dr. Nevin in University College, Dublin and by Mr. McCusker and Dr. Ritson in 5 Merrion Square showed that there are very few, if any, delayed particles in air showers. Mr. McCusker and Dr. Nevin using a cloud chamber on loan from University College, Dublin, studied the multiplication of the soft component of air showers in passing through several thin lead plates in the chamber and showed that the results agreed with the predictions of the Bhabha-Chakrabarty theory of shower production. Both this and the preceding investigation had been commenced during the preceding year.

Dr. Ritson completed his measurements on the absorption of penetrating particles in local penetrating showers in lead.

During the year Mr. McCusker and Dr. Millar began and completed an experiment to study the variation of the ratio of the density of

penetrating particles to the density of electrons in air showers. For most showers the ratio is about one to forty but a small number of showers was observed which consisted almost entirely of penetrating particles. These showers were probably the penetrating tail of air showers the electronic component of which had been observed higher in the atmosphere.

Two experiments were begun during the year by Mr. McCusker and Dr. Millar with the original intention of studying the question of whether mesons are produced one or several at a time in nucleon nucleon collisions. The first and simpler experiment using the University College, Dublin cloud chamber involved a study of penetrating showers produced in water and carbon. The experiment was still in progress at the end of the year but early in 1951 several examples of the unstable neutral particles called V particles were observed. The study of the nature of these V particles is at present one of the most active fields of work in cosmic radiation. These examples were carefully studied and the results sent for publication. The second experiment involving the study of penetrating showers produced in a large tank of water by a large array of counters and a multi-channel hodoscope was still in preparation at the end of the year though nearly ready to run.

An experiment by Dr. Nevin, Mr. McCusker and Mr. Doyle, a research student of University College, Dublin, to search for air showers of very great extension was under preparation for most of the period. This experiment involved the construction of large metal counters of a new type. For reasons of practical convenience most of the work done during the year on the construction of the counter boxes and the associated electronic equipment was carried on in University College, Dublin. The Engineering Department of the College lent considerable assistance in connection with the details of the mechanical design and construction of the counter boxes.

With the departure of Professor Jánossy the theoretical work on

showers with which he had been associated came to an end. During the latter part of his stay in the School Mr. Messel began the work on the theory of nucleon cascades which he continued in the School of Theoretical Physics. Close contact with the School of Theoretical Physics was maintained during the year by an informal seminar on Tuesday afternoons at which theoretical and experimental discussions alternated weekly.

The workshop was fully engaged during the year on the construction of apparatus for the various experimental investigations in progress or under development. Much progress was made with the construction of the large magnet which will be so important for the work of the section in the future. Constructional work had been much delayed earlier by supply difficulties but by the end of the year the coils had been wound and placed in position and the machining of the perspex casings was in hand.

3. LECTURES.

From October to February Mr. McCusker delivered a very well attended course of lectures on Electronic Pulse Techniques. During February Mr. McCusker also gave three lectures on Recent Advances in Cosmic Rays.

4. CONFERENCES.

Professor Jánossy attended a conference on Elementary Particles in Paris 17 - 23 April 1950 at which he presented jointly with Professor Heitler a paper on penetrating showers.

5. PUBLICATIONS.

Contributions to Periodicals:

W. Heitler and L. Jánossy: Further investigation on the plural production of meson showers.
Helv. Phys. Acta, 23, 417, 1950.

C. B. A. McCusker, D. M. Ritson and T. E. Nevin: Delayed particles in extensive air showers. Nature, 166, 400, 1950.

L. Jánossy and H. Messel: Fluctuations of the electron-photon cascade.
Proc. Phys. Soc. A 63, 1101, 1950.

H. Messel and D. M. Ritson: Energy losses of ionizing particles at relativistic velocities in the photographic plate.
Phil. Mag. 41, 1129, 1950.

C. B. A. McCusker: Penetrating particles in air showers.
Proc. Phys. Soc. A 63, 1240, 1950.

D. M. Ritson: Absorption of penetrating shower secondaries.
Phil. Mag. 42, 250, 1950.

L. Jánossy: On the lateral spread of extensive air showers.
Proc. Phys. Soc. A 63, 1009, 1950.

L. Jánossy: On the absorption of a nucleon cascade.
Proc. Roy. Ir. Acad. A 53, 181, 1950.

L. Jánossy: Search for periods.
Hungarica Physica Acta, May, 1950.

H. Messel and D. M. Ritson: On the development of the nucleon component of the cosmic radiation in air.
Proc. Phys. Soc. A 63, 1359, 1950.

D. M. Ritson: Slow mesons in the backward flux of the cosmic radiation.
Proc. Phys. Soc. A 63, 1098, 1950.

D. D. Millar: The nature of the penetrating particles in air showers.
Proc. Roy. Ir. Acad. A 54, 115, 1951.

H. Messel: On the fluctuation of a nucleon cascade in homogeneous nuclear matter and calculation of average numbers.
Proc. Roy. Ir. Acad. A 54, 125, 1951.

L. Jánossy and H. Messel: Cascade theory including ionization loss.
Proc. Phys. Soc. A 64, 1, 1951.

C. Geophysical Section.

1. ACADEMIC STAFF AND SCHOLARS.

Senior Professor:

Leo W. Pollak, Director of the School.

Assistant Professor:

Thomas Murphy

Research Associate:

P. J. Nolan.

Senior Technical Assistant:

Thomas J. Morley.

Junior Technical Assistant:

Miss Nuala O'Brien.

Junior Meteorological Observer:

Kevin Bolster (until 2 December 1950)
Patrick Smyth (from 19 February 1951).

Scholars:

P. G. Tedde, S.J. (left 15 September 1950);

P. R. Nolan (left 15 June 1950);

Seamus G. Miller (entered 5 March 1951).

2. RESEARCH AND OBSERVATIONAL WORK.

Surveys.

In May 1950 an itinerary (total mileage 2,500) for the continuetion of the gravity survey of Ireland was drawn up at a conference held in Dublin between representatives of the School and the Department of Geodesy and Geophysics of Cambridge University. At a conference held in the School in July 1950, between Brigadier K. M. Papworth, Director of the Belfast Ordnance Survey Office, Professor Pollak and Mr. Murphy, all outstanding problems regarding the magnetic and gravity surveys in the six north-eastern counties of Ireland were solved.

The gravity survey of Ireland north of the line Sligo-Dundalk was completed in September 1950. Measurements were taken at 350 stations. The work was carried out by Dr. A. H. Cook of Cambridge and Mr. Murphy with the active collaboration of the Belfast Ordnance Survey Office under the direction of Brigadier Papworth. By mutual agreement between the three parties concerned the results of this team work will be published in the series of Geophysical Memoirs. The survey has given a wealth of interesting results of both scientific and economic importance.

The magnetic survey is being carried out with the active collaboration of both the Dublin and Belfast Ordnance Survey Offices. The field-work, which started in March 1950, progressed satisfactorily. Apart from one station which was inaccessible because of standing crops the magnetic elements at all the selected stations south of the line Sligo-Dundalk were measured. The geodetic party from the Dublin Ordnance Survey Office was seriously handicapped by the exceptionally bad weather and their astronomical measurements were considerably delayed. In August 1950 Mr. Murphy made a preliminary tour of magnetic stations north of the Sligo-Dundalk line which had been occupied by the British team in 1915.

Professor Pollak and Mr. Murphy compared the C.I.W. magnetometer used for the survey with the British standard at Abinger in July 1950. Their measurements agreed perfectly with those of the Abinger observer. In August 1950 they visited Cahirciveen in order to compare the magnetometer with that of Valentia Observatory.

Experimental Work.

Professor Pollak assembled equipment for an absolute calibration of the photo-electric nucleus counter without employing an Aitken counter hitherto used for its calibration. The design for this instrument was completed and its construction in the workshop of the School was commenced.

The Department of Defence has granted facilities for a proposed series of geophysical aeroplane ascents. An improved photo-electric nucleus counter was constructed in the workshop for this and other purposes.

Construction of a mobile meteorological laboratory built into the Survey van progresses satisfactorily and the equipment was tested by Professor Pollak and Mr. Murphy on their journey to Valentia in August 1950. Several measurements with an improved version of the photo-electric nucleus counter were made. This mobile unit will be used for a proposed micro-meteorological survey of Ireland and will form the base station for the aeroplane ascents referred to in the preceding paragraph.

Assistance in the solution of certain meteorological problems was given to Bord na Móna at the request of the Managing Director and some equipment available in the School was lent to their experimental station at Newbridge.

Some investigations in the field of Agricultural Meteorology were brought to a conclusion and the results published. The method used for the prediction of sugar beet yield in Ireland is now being tested on a long-period record from a sugar beet growing country in Europe.

As a result of enquiries from the Department of Agriculture as to whether the School could assist with suggestions as to how weather forecasting could be improved in the interest of the agricultural industry, a report dealing with forecasting of crop yield from meteorological factors, horticultural protection service and medium- and long-range weather forecasting was submitted to the Department by Professor Pollak in September 1950. A preliminary programme for carrying out such work was subsequently submitted.

Observational Work.

Meteorological observations and research was maintained throughout the year under review. A Negretti and Zambra mercury-in-steel distant recording dry and wet bulb hygrometer was installed in the Observatory.

By agreement between the Board of the University of Dublin and the authorities of the School the latter have been operating the meteorological station in Trinity College since 19 July 1950.

3. LECTURES AND DISCUSSIONS.

Meetings of the Meteorological and Geophysical Seminar were held monthly, except in July, August and September, in the lecture room of the School at 7.30 p.m. The following lectures were delivered:

Professor J. H. J. Poole, Trinity College, Dublin: The use of nuclear plates in the investigation of the radioactivity of natural materials.

Mr. P. R. Nolan and Professor Pollak: Forecasting of crop yield.

Mr. F. E. Dixon, Meteorological Service, Dublin: The jet stream.

Professor E. C. Bullard, Director, National Physical Laboratory, Teddington: On the origin of the Earth's magnetic field.

Mr. Seán Mac Airt, M.A., Queen's University, Belfast: Notices of natural and meteorological phenomena in the early Irish annals.

A. H. Cook, Department of Geodesy and Geophysics, Cambridge University: The progress of the gravity survey of England.

Rev. Dr. R. E. Ingram, S.J., Director, Seismic Observatory, Rathfarnham: Microseismics and Weather.

R. C. Bannister, B.Sc., Meteorological Service, Dublin: Weather forecasting in the Far East.

Dr. H. H. Poole, Dublin: Sub-marine daylight and its measurement.

Dr. P. J. Nolan delivered a course of lectures on Ionisation in closed vessels in the Michaelmas term.

Professor Pollak delivered a course of lectures on General Meteorology in University College, Dublin. The lectures were delivered weekly and were attended by 25 to 30 students of the Science Faculty.

At the request of Comhlucht Siúicre Éireann a lecture on Forecasting of crop yield was delivered by Professor Pollak and Mr. P. R. Nolan to the Company's scientific staff on 26 May 1950. A discussion followed the lecture.

Professor Pollak delivered a public lecture on Climatic changes through the Centuries in University College, Galway, on 8 November 1950.

On the occasion of the Dublin meeting of the Royal Astronomical Society a geophysical discussion was held under the auspices of the School on 23 September 1950, in the Meeting Room of the Royal Irish Academy. The principal speaker was Professor J. H. J. Poole, who discussed the Evolution of the Earth's Atmosphere.

4. STATUTORY PUBLIC LECTURE.

The Statutory Public Lecture, entitled Is the Earth getting warmer? was delivered by Professor Pollak in University College, Dublin on 3 November 1950.

5. VISITORS.

Professor F. Verzar, Director of the Physiological Institute in the Medical Faculty of the University in Basel (Switzerland) visited the Geophysical Section in order to acquaint himself with details of the construction and use of the photo-electric nucleus counter. According to recent information received, several counters are under construction in Basel and they will be used in various high altitude observatories.

6. PUBLICATIONS.

(1) Geophysical Memoirs of the Dublin Institute for Advanced Studies.

No.2 - Part 1: Measurements of Gravity in Ireland, Pendulum Observations at Dublin, Sligo, Galway and Cork. By A. H. Cook.
Published 1950. pp. 28. Price 10s. 6d.

No.3 - Part 1: On the Prediction of the Yield and Sugar Content of Sugar Beet in Ireland. By P. R. Nolan and L. W. Pollak.
Published 1950. pp. 53. Price 12s. 6d.

(2) Geophysical Bulletin of the Dublin Institute for Advanced Studies.

No. 2: Provisional Values for Magnetic Declination in Ireland for the Epoch 1950.5. By Thomas Murphy.

Published 1951.

(3) Meteorological Bulletin of Dublin City. Issued monthly.

(4) Contributions to periodicals.

P. J. Nolan and P. G. Tedde, S.J.: Condensation Nuclei and meteorological elements in Dublin. Archiv für Meteorologie, Geophysik und Bioklimatologie. Serie A, 2, 374, 1950

(5) Other Publications.

Methods in Climatology, including methods in General Geophysics. By V. Conrad and L. W. Pollak.
Harvard University Press, Cambridge, Mass., U.S.A. 1950.

Water vapour and humidity measurements; the kata-thermometer. By L. W. Pollak. (Section 8 in Physico-Chemical Methods. Edited by J. Reilly and W. Norman Rae. 5th edn. Methuen and Co., London 1950.)

A Report on the activities of the Meteorological and Geophysical Section of the School from 1947 to 1950 was prepared for submission at the General Assembly of the International Union of Geodesy and Geophysics meeting at Bruesels in 1951.

D. Mac GRIANNA
CLÁRTHÓIR

PÁDRAIG De BRÚN
CATHAOIRLEACH

28 Márta 1951